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Smoking and attitudes towards smoking among Estonian physicians: results from cross-sectional studies in 2002 and 2014

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Abstract

Objectives: The objective of the study was to explore smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014.

Design: Self-administered cross-sectional postal surveys were conducted. The data was collected from all practicing physicians in Estonia.

Participants: Sample for the present study was restricted to physicians younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Outcome measures: Smoking prevalence was determined. Logistic regression analysis was used to analyse association of physicians' attitudes towards smoking with study year and smoking status. Adjusted odds ratios of agreement with seven statements concerning attitudes towards smoking and the corresponding 95% confidence intervals were calculated.

Results: In 2002, 18.5% of men and 12.5% of women were daily smokers, in 2014, 12.5% and 5.0%, respectively (difference between study years p=0.001 among men, p<0.001 among women). Compared to 2002, attitudes towards smoking were stricter in 2014. Compared to non-smokers, smoking physicians approved significantly less that 'smoking is very harmful' and 'it is important to reduce smoking among population'. Compared to non-smokers, smoking physicians agreed significantly more that 'as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare', 'to smoke or not to smoke, that is my personal choice', 'to stop smoking is very hard for many people, so it is better for their health to continue smoking', 'smoking does not damage my health as long as I follow a healthy lifestyle in other fields' and 'smoking is only dangerous to my health if I smoke more than 10 cigarettes a day'.

Conclusions: Smoking among Estonian physicians declined and attitudes towards smoking changed for less favourable from 2002 to 2014. Smoking physicians had more approving attitudes towards smoking than their non-smoking colleagues and this remained the same over the study period.

Keywords: smoking, physicians, attitudes, Estonia.

Strengths and limitations of this study

- The surveys were nationwide.
- Methods and questionnaires used in 2002 and 2014 were similar.
- The surveys relied on self-reported data and therefore the bias of self-representation should be considered.
- In terms of response rates, the possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates.

INTRODUCTION

Smoking is among the leading preventable causes of death and is considered a major public health threat. According to WHO, among adults aged 30 years and over, 12% of all deaths are attributed to tobacco[1]. Reducing smoking will result in fewer deaths and less diseases like lung cancer, heart diseases, stroke, chronic respiratory diseases and other conditions[2].

Physicians are generally regarded as people from whom smokers would accept advice on smoking cessation[3]. However, physicians' smoking status could affect their attitudes towards smoking and their enthusiasm in addressing patients' smoking[4, 5].

Smoking behaviour among physicians has been studied for decades. British male doctors smoking cohort study is the most commonly known and began in 1951[6]. In the developed countries (e.g. United States, Australia, Finland, Denmark), smoking among physicians has declined during the last decades[7–9] thus being lower than in general population and reflecting the maturity of the country's tobacco epidemic. At the same time, in the developing countries (e.g. Mexico, Philippines) smoking prevalence rates among physicians are much higher than in developed countries being in some cases even higher than in general population[10, 11]. In Estonia smoking among physicians has declined since 1978[7, 12, 13] and despite being lower than in general population is still higher than smoking among doctors in neighbouring country Finland[7].

As smoking physicians tend to underestimate smoking as a risk factor, it is important to analyse physicians' smoking and their attitudes towards smoking to involve them in patients' smoking cessation more effectively.

The objective of this study was to explore smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014.

METHODS

Study design

In both years, 2002 and 2014, the data was collected from all practicing physicians in Estonia. In 2002, physicians were drawn from the database of Estonian Health Insurance Fund. In 2014, sample was based on the data from the Estonian Health Care Professionals Registry in Estonia.

The survey was conducted as self-administered cross-sectional postal survey. In both study years, similar questionnaires were used. The questionnaires concerned individual characteristics, smoking habits, attitudes towards and knowledge about tobacco use but also attitudes towards patients' smoking. In 2002, the questionnaires were mailed to the physicians' workplace. Non-respondents received the questionnaire twice. In 2014, the survey materials were mailed to the physicians' home address. To receive home addresses, data from the Estonian Health Care Professionals Registry were linked with the Population Registry in Estonia. Non-respondents received a reminder letter in a month and another envelope containing survey materials in two months.

The initial sample size was 4140 practicing physicians in 2002 and 5666 in 2014 (Table 1). Number of respondents was 2747 and 2903, respectively. The crude response rates were 66.3% in 2002, and 52.0% in 2014. Corrected response rates (excluding the persons who were unavailable, retired, had wrong address, left Estonia or were dead) were 67.8% and 53.1%, respectively.

The sample for the present study was restricted to physicians who were younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Table 1. Initial sample size, number of respondents, crude and corrected response rates among physicians by study year in Estonia.

Study year	Initial sample size			Number of respondents			Response rate (%)	
	Men	Women	Total	Men	Women	Total	Crude	Corrected
2002	846	3294	4140	471	2276	2747	66.3	67.8
2014	1283	4383	5666	529	2363	2903	52.0	53.1

Study variables

Smoking status was determined by combining answers to several questions concerning smoking and classified as daily, occasional, past and never smokers and dichotomized to current smokers (daily and occasional smokers) and non-smokers (past and never smokers).

Statements concerning smoking. Attitudes towards smoking were determined with following seven statements:

- Smoking is very harmful to health
- It is important to reduce smoking among the population
- As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare
- To smoke or not to smoke-that is my personal choice
- To stop smoking is very hard for many people, so it is better for their health to simply continue smoking
- Smoking does not damage my health as long as I follow a healthy life style in other fields
- Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day.

In the first statement physicians assessed the harmfulness of smoking using 10-point scale (10 = very harmful). Those who had chosen 8–10, were considered as having agreed that smoking is very harmful to the health. Those who had chosen 1–7, were considered as disagreed. In all other statements, possible answers were completely agree / somewhat agree /rather disagree / completely disagree / cannot say. Answers were dichotomized as agree (completely agree,

somewhat agree) and disagree (rather disagree, completely disagree). Those who answered 'cannot say' were excluded from further analysis.

Data analysis

Data was analysed separately for men and women. Smoking prevalence was determined. Differences of smoking prevalence between study years were analysed using chi-square test.

Logistic regression analysis was used to analyse association of physicians' attitudes towards smoking with study year and smoking status. Odds ratios (OR) of agreement with the statements concerning attitudes towards smoking and the corresponding 95% confidence intervals (CI) were calculated. In the model ORs were adjusted for study year, smoking status, age and ethnicity.

Subjects with missing smoking status values (n=11) were excluded from the analysis. In total, 4877 questionnaires were included to the analysis (n=2539 in 2002, n=2338 in 2014). Before logistic regression analysis, questionnaires that lacked information concerning attitudes towards smoking or where 'cannot say' was answered were excluded from the further analysis.

Data was analysed using statistical package Stata 11.

RESULTS

Smoking status

Smoking prevalence was statistically significantly lower in 2014 ($p<0.001$ among both, men and women). In 2002, 18.5% of men and 12.5% of women were daily smokers. In 2014, the prevalence of daily smoking was 12.5% and 5.0%, respectively (Figure 1). In 2002, 7.7% and in 2014, 3.7% of men were occasional smokers. Among women the prevalence of occasional smoking was 3.7% and 1.4%, respectively.

Compared to 2002, the prevalence of past smoking remained similar among male physicians in 2014 (31.4% in 2002 and 30.1% in 2014). However, among female physicians, prevalence of past smoking was 30.1% in 2002 but 18.3% in 2014.

In 2002, 42.5% and in 2014, 53.8% of men were never smokers. Among women 53.8% were never smokers in 2002, but 73.5% in 2014.

Attitudes towards smoking

Table 2 summarizes physicians' responses regarding attitudes towards smoking in 2002 and 2014. Compared to 2002, in 2014 the attitudes towards smoking were less favourable among both, male and female physicians.

Table 2. Attitudes towards smoking (N, %) among Estonian physicians in 2002 and 2014.

Statements	Men		Women	
	2002	2014	2002	2014
	N (%)	N (%)	N (%)	N (%)
Smoking is very harmful to the health				
Agree	264 (63.3)	323 (79.0)	1524 (71.5)	1701 (88.1)
Disagree	147 (35.3)	83 (20.3)	582 (27.3)	221 (11.5)
Cannot say/missing	6 (1.4)	3 (0.7)	26 (1.2)	8 (0.4)
It is important to reduce smoking among the population				
Agree	371 (89.0)	394 (96.3)	1990 (93.3)	1887 (97.8)
Disagree	30 (7.2)	9 (2.2)	65 (3.1)	19 (1.0)
Cannot say/missing	16 (3.8)	6 (1.5)	77 (3.6)	24 (1.2)
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare				
Agree	71 (17.0)	65 (15.9)	322 (15.1)	222 (11.5)
Disagree	310 (74.3)	331 (80.9)	1600 (75.1)	1646 (85.3)
Cannot say/missing	36 (8.7)	13 (3.2)	210 (9.8)	62 (3.2)
To smoke or not to smoke-that is my personal choice				
Agree	223 (53.5)	209 (51.1)	1021 (47.9)	822 (42.6)
Disagree	167 (40.0)	188 (46.0)	993 (46.6)	1085 (56.2)
Cannot say/missing	27 (6.5)	12 (2.9)	118 (5.5)	23 (1.2)
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking				
Agree	98 (23.5)	58 (14.2)	393 (18.4)	262 (13.6)
Disagree	280 (67.1)	337 (82.4)	1464 (68.7)	1601 (83.0)
Cannot say/missing	39 (9.4)	14 (3.4)	275 (12.9)	67 (3.4)
Smoking does not damage my health as long as I follow a healthy life style in other fields				
Agree	42 (10.1)	23 (5.6)	171 (8.0)	79 (4.1)
Disagree	348 (83.4)	375 (91.7)	1805 (84.7)	1810 (93.8)
Cannot say/missing	27 (6.5)	11 (2.7)	156 (7.3)	41 (2.1)
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day				
Agree	55 (13.2)	35 (8.5)	166 (7.8)	85 (4.4)
Disagree	328 (78.7)	359 (87.8)	1780 (83.5)	1791 (92.8)
Cannot say/missing	34 (8.1)	15 (3.7)	186 (8.7)	54 (2.8)

Association of physicians' attitudes towards smoking with study year and their smoking status

Compared to 2002, physicians agreed significantly more with the statements 'smoking is very harmful' and 'it is important to reduce smoking among the population' in 2014 (Table 3). Compared to non-smokers, smoking physicians approved these two statements significantly less.

While no association was found between study years and the statements 'as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare' and 'to smoke or not to smoke, that is my personal choice' among men, then compared to the study year 2002, there was significantly lower number of women supporting these statements in 2014. Compared to non-smoking physicians, smoking men and women agreed significantly more with these two statements.

Compared to study year 2002, agreement with statements 'to stop smoking is very hard for many people, so it is better for their health to simply continue smoking', 'smoking does not damage my health as long as I follow a healthy life style in other fields' and 'smoking is only dangerous to my health if I smoke more than 10 cigarettes a day' was significantly lower in 2014. Compared to non-smoking physicians, agreement with these three statements was significantly higher among smoking physicians.

Table 3. Association of physicians' attitudes towards smoking with study year and smoking status (OR, 95% CI) among Estonian physicians in 2002 and 2014.

Agree	Men	Women
	OR[a] (95% CI)	OR[a] (95% CI)
Smoking is very harmful to the health		
2002	1.00	1.00
2014	**2.07 (1.48–2.89)**	**2.89 (2.43–3.45)**
Non-smokers	1.00	1.00
Smokers	**0.29 (0.20–0.42)**	**0.21 (0.17–0.27)**
It is important to reduce smoking among the population		
2002	1.00	1.00
2014	**3.98 (1.78–8.94)**	**3.11 (1.84–5.27)**
Non-smokers	1.00	1.00
Smokers	**0.44 (0.22–0.87)**	**0.26 (0.16–0.44)**
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare		
2002	1.00	1.00
2014	0.98 (0.65–1.47)	**0.68 (0.56–0.82)**
Non-smokers	1.00	1.00
Smokers	**5.67 (3.74–8.59)**	**3.88 (3.00–5.01)**
To smoke or not to smoke-that is my personal choice		
2002	1.00	1.00
2014	0.99 (0.73–1.34)	**0.76 (0.66–0.86)**
Non-smokers	1.00	1.00
Smokers	**5.64 (3.60–8.84)**	**4.80 (3.64–6.32)**
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking		
2002	1.00	**1.00**
2014	**0.49 (0.33–0.72)**	**0.61 (0.51–0.73)**
Non-smokers	1.00	1.00
Smokers	**2.47 (1.64–3.71)**	**3.50 (2.71–4.52)**
Smoking does not damage my health as long as I follow a healthy life style in other fields		
2002	1.00	1.00
2014	**0.43 (0.24–0.78)**	**0.46 (0.34–0.61)**
Non-smokers	1.00	1.00
Smokers	**6.89 (3.98–11.94)**	**4.41 (3.19–6.08)**
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day		
2002	1.00	1.00
2014	**0.57 (0.35–0.94)**	**0.50 (0.38–0.66)**
Non-smokers	1.00	1.00
Smokers	**4.54 (2.81–7.31)**	**4.27 (3.08–5.93)**

[a]Adjusted for study year, smoking status, age and ethnicity.

DISCUSSION

The study analysed smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014. Compared to the first study year, smoking prevalence was lower in 2014. Compared to the year 2002, attitudes towards smoking were less favourable in 2014. However, smoking physicians had more favourable attitudes towards smoking than their non-smoking colleagues and this remained the same over the study period.

Study limitations and strengths. Before discussing the results, possible limitations should be addressed. First, as the study relied on self-reported data, the bias of self-representation should be considered. Second, the corrected response rates of 67.8% in 2002 and 53.1% in 2014 should be taken into account. The possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates. Despite these shortcomings, the survey data provides an excellent opportunity to analyse changes in smoking status and attitudes towards smoking as both surveys were nationwide, the survey methods and questionnaires were similar, and physicians are considered a very homogenous cohort.

Smoking status. The prevalence of daily smoking among physicians decreased 1.5 times among men and 2.5 times among women from 2002 to 2014. This result was expected as smoking among physicians in Estonia has decreased since 1978[14]. The proportion of physicians who had never smoked increased. In 2014, more than half of men and three-quarters of women had never smoked. Smoking rates in Estonia have come down among general population as well. In 2002, daily smoking prevalence was 49.6% among men and 20.3% among women[15]. In 2014, 31.4% of men and 15.8% of women were daily smokers. The prevalence of smoking was lowest among men and women with higher education[16]. Although Estonia is considered to have reached the mature state in terms of smoking

epidemic, the prevalence of daily smoking among physicians in 2014 was still comparable to the rates of daily smoking among Finnish doctors in 2002[7].

Attitudes towards smoking and association with study year and smoking status. The results of this study showed that attitudes towards smoking became stricter from 2002 to 2014 but association with smoking status remained the same.

Agreement with the statements that smoking is very harmful and that it is important to reduce smoking among the population was more prevalent in 2014 and less prevalent among smoking physicians. This finding is in accordance with previous international studies showing that compared to non-smokers, smoking physicians agree less that smoking is harmful[4].

No association was found between study year and agreement with the statement 'as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare' and 'to smoke or not to smoke-that is my personal choice' among men. Among women, agreement with these two statements was less pronounced in 2014. This confirms results from previous studies, according to which smoking behaviour has different patterns among men and women[17, 18]. The difference in opinions might be related to the fact that behaviour of men in general is considered to be more risk-prone. Compared to non-smokers, smoking men and women agreed significantly more with the mentioned two statements in this study. For smokers, these beliefs might be based on the fact that not all persons who smoke will develop adverse effects of smoking. Also, there might be persons for whom even heavy smoking during several years has not resulted in lung cancer or other smoking-related diseases.

Agreement with the statements 'to stop smoking is very hard for many people, so it is better for their health to simply continue smoking', 'smoking does not damage my health as long as I follow a healthy life style in other fields' and 'smoking is only dangerous to my health if I smoke more than 10 cigarettes a day' was more prevalent in 2014 and less

prevalent among smoking physicians. Most drastically, compared to non-smokers, men who smoked, had six times higher odds to agree that smoking is not as dangerous as experts declare since many people have smoked their whole lives and have not become ill, and had seven times higher odds to agree that smoking does not damage health if the person leads an otherwise healthy lifestyle.

Although it has been shown before that physicians' beliefs about smoking-related diseases were consistent with medical evidence[14], the results of present study showed that physicians who smoke, may see smoking more favourably. These opinions can affect smoking cessation activities of the physicians as it has been shown that smokers might not anticipate health problems related to smoking[19].

Physicians agree that it is important to reduce smoking, but they also believe that to smoke is their own choice. Smoking physicians might feel the need for justification for their own behaviour, especially if they have not developed any smoking-related health problems. Opinions on that matter might also indicate that physicians lessen their role in reducing smoking in the population. According to the worldwide literature, attitudes towards smoking differ by region. In former studies among Italian physicians specializing in public health, 79.6% considered health professionals as behavioural models for patients, and 96.6% affirmed that health professionals have a role in giving advice or information about smoking cessation[20]. In Serbia, 60.7% of physicians agreed that healthcare professionals serve as role models for their patients and public[21]. However, data from a focus group interview carried out among Armenian doctors revealed that the majority of doctors believed they have no role in patients' quitting[22]. Compared to Finnish physicians, Estonian physicians were less conscious of their role as healthy life style exemplars in 2002[7]. Authors then argued that there might be a fear to influence other people's behaviour in Estonia. Results of the present study indicate that the fear still exists.

Overall, Estonian physicians' attitudes towards smoking have improved from 2002 to 2014 and the developments concerning reducing smoking in Estonia have created a supportive environment for that. Estonian Tobacco Act, enforced in 2001, renewed in 2005 and amended since with several legal instruments, sets the requirements for creating a smoke-free environment, availability and pricing of tobacco products. Many of Estonian health care institutions have joined the network for tobacco free health services[23] and despite the fact that in health care institutions in Estonia, smoking is still allowed in designated smoking areas, many hospitals promote reducing smoking among staff, have prohibited smoking everywhere in the hospital area and have declared the hospital smoke-free.

Conclusions

Prevalence of smoking decreased among Estonian physicians over the period from 2002 to 2014. Although, compared to 2002, attitudes towards smoking were stricter in 2014, it was still apparent that doctors who smoked viewed smoking more favourably and this remained the same over the study period.

Continuing to monitor physicians' attitudes towards smoking provides valuable information that can support reduction of smoking among doctors as well as among general population and encourages physicians to pay attention to the patients' smoking.

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Ethics approval and consent to participate

The surveys in 2002 and 2014 were approved by the Research Ethics Committee of the University of Tartu (decisions no. 87/1 and 235/T-12, respectively). An informed consent form including a description of the study design and how the collected data would be used was sent to the recipients with the questionnaires. The form explained that participation in the study would be considered to constitute consent. Additional written consent was not obtained.

Consent for publication

Not applicable.

Availability of data and material

The datasets of 2002 and 2014 are available on request.

Competing interests

The authors declare that they have no competing interests, or other interests that might be perceived to influence the results and discussion reported in this paper.

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Contributions

MP: performed the statistical analysis, interpretation of the data, drafted the manuscript and has been involved in revising the manuscript critically.

KP: made a substantial contribution to the conception and the design of the study, interpretation of the data and has been involved in revising the manuscript critically. Authors have read and approved the final manuscript.

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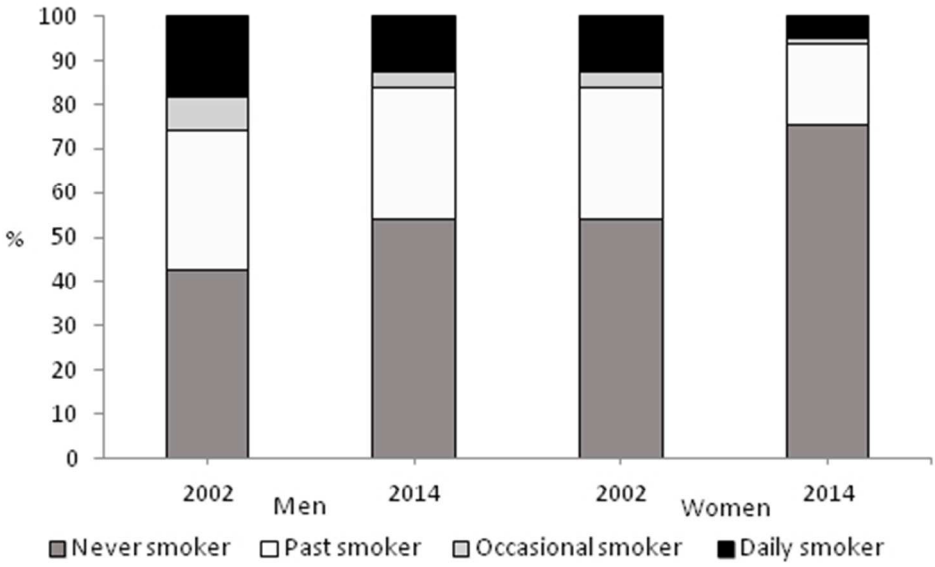
Figure 1. Smoking prevalence (%) among Estonian physicians in 2002 and 2014 (difference between study years p=0.001 among men, p<0.001 among women).



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Abstract

Objectives: To explore smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014.

Design: Two self-administered cross-sectional postal surveys were conducted gathering data from all practicing physicians in Estonia.

Participants: Present study sample was restricted to physicians younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Methods: Smoking prevalence was determined. To analyse association of physicians' attitudes towards smoking with study year and smoking status, logistic regression analysis was used. Adjusted odds ratios of agreement with seven statements concerning attitudes towards smoking were determined. Corresponding 95% confidence intervals were calculated.

Results: The age-standardized prevalence of current smoking among men was 26.8% in 2002 and 15.3% in 2014, among women 10.4% and 5.8%, respectively. Compared to 2002, in 2014 physicians agreed significantly more with statements 'smoking is harmful', 'it is important to reduce smoking among population', 'to stop smoking is very hard for many people, so it is better for their health to continue smoking', and 'smoking does not damage my health as long as I follow a healthy lifestyle in other fields'. Compared to 2002, agreement with the statements 'as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare', 'to smoke or not to smoke, that is my personal choice', and 'smoking is only dangerous to my health if I smoke more than 10 cigarettes a day' was significantly higher in 2014 among female physicians only. Based on all of the seven statements, physicians' attitudes towards smoking were associated with their smoking status.

Conclusions: Compared to 2002, smoking was lower and attitudes towards smoking were less favourable among Estonian physicians in 2014. Smoking physicians had more approving attitudes towards smoking than their non-smoking colleagues and this remained the same over the study period.

Strengths and limitations of this study

- The surveys were nationwide, initially involving all practicing physicians in Estonia.
- Changes in smoking prevalence were easily comparable due to similar methods and questionnaires used in 2002 and 2014.
- The surveys relied on self-reported data and therefore the bias of self-representation should be considered.
- In terms of response rates, the possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates.

INTRODUCTION

Smoking is among the leading preventable causes of death and is considered a major public health threat. According to WHO, among adults aged 30 years and over, 12% of all deaths are attributed to tobacco.[1] Reducing smoking will result in fewer deaths and less diseases like lung cancer, heart diseases, stroke, chronic respiratory diseases and other conditions.[2]

Physicians are generally regarded as people from whom smokers would accept advice on smoking cessation.[3] However, physicians' smoking status could affect their attitudes towards smoking and their enthusiasm in addressing patients' smoking.[4, 5]

Smoking behaviour among physicians has been studied for decades. British male doctors smoking cohort study is the most commonly known and began in 1951.[6] In the developed countries (e.g. United States, Australia, Finland, Denmark), smoking among physicians has declined during the last decades,[7–9] being lower than in general population and thus reflecting the maturity of the country's tobacco epidemic. At the same time, in the developing countries (e.g. Mexico, Philippines) smoking prevalence rates among physicians are much higher than in developed countries being in some cases even higher than in general population.[10,11] In Estonia smoking among physicians has declined since 1978.[12–15] Despite being lower than in general population, smoking among doctors in Estonia is still higher than in neighbouring country Finland.[12]

As smoking physicians tend to underestimate smoking as a risk factor, it is important to analyse physicians' smoking and their attitudes towards smoking to involve them in patients' smoking cessation more effectively.

The objective of this study was to explore smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014.

METHODS

Study design

The present study was based on two cross-sectional self-administered postal smoking surveys among Estonian physicians in 2002 and 2014. In 2002, physicians were drawn from the database of Estonian Health Insurance Fund. In 2014, sample was based on the data from the Estonian Health Care Professionals Registry. In 2002, the questionnaires were mailed to the physicians' workplace. Non-respondents received the questionnaire twice. In 2014, the survey materials were mailed to the physicians' home address. To receive home addresses, data from the Estonian Health Care Professionals Registry were linked with the Population Registry in Estonia. Non-respondents received a reminder letter in a month and another envelope containing survey materials in two months.

The questionnaire used in these surveys was originally developed by the WHO and modified according to the Estonian health care system.[16] In 2014, the questions regarding nicotine dependence were added to the questionnaire. Questionnaires concerned individual characteristics, smoking habits, attitudes towards and knowledge about tobacco use but also attitudes towards patients' smoking.

Initially, the surveys involved all practicing physicians in Estonia. The survey sample size was 4140 practicing physicians in 2002 and 5666 in 2014 (Table 1). Number of respondents was 2747 and 2903, respectively. The crude response rate was 66.3% in 2002, and 52.0% in 2014. Corrected response rates (excluding the persons who were unavailable, retired, had wrong address, left Estonia or were dead) were 67.8% and 53.1%, respectively.

The sample for the present study was restricted to physicians who were younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Table 1. Initial sample size, number and percentage of respondents, crude and corrected response rates by gender among Estonian physicians in 2002 and 2014

Study year	Initial sample size (n, %)			Number of respondents (n, %)			Response rate (%)	
	Men	Women	Total	Men	Women	Total	Crude	Corrected
2002	846 (20.4)	3294 (79.6)	4140	471 (17.1)	2276 (82.9)	2747	66.3	67.8
2014	1283 (22.6)	4383 (77.4)	5666	532 (18.3)	2371 (81.7)	2903	51.9	53.1

Study variables

The main outcomes were smoking status and physicians' attitudes towards smoking.

Smoking status was determined by combining answers to several questions concerning smoking and classified as following:

- Daily smokers (those who currently smoke every day);
- Occasional smokers (those who currently smoke but not every day)
- Past smokers (those who have smoked regularly for at least a year but are currently non-smokers);
- Never smokers (those who have smoked irregularly less than a year but are not current smokers or have never smoked at all).

For secondary data analysis smoking status was dichotomized to current smokers (daily and occasional smokers) and non-smokers (past and never smokers). Smoking, in the present study, was defined as smoking cigarettes.

Statements concerning smoking. Attitudes towards smoking were determined with following seven statements:

- Smoking is very harmful to health;
- It is important to reduce smoking among the population;
- To stop smoking is very hard for many people, so it is better for their health to simply continue smoking;
- Smoking does not damage my health as long as I follow a healthy life style in other fields;

- As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare;
- To smoke or not to smoke, that is my personal choice;
- Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day.

In the first statement physicians assessed the harmfulness of smoking using 10-point scale (10 = very harmful). Those who had chosen 8–10, were considered as having agreed that smoking is very harmful to the health. Those who had chosen 1–7, were considered as disagreed. In all other statements, possible answers were completely agree / somewhat agree /rather disagree / completely disagree / cannot say. For secondary analysis answers were dichotomized as agree (completely agree, somewhat agree) and disagree (rather disagree, completely disagree). Background variables age, ethnicity, place of residence and medical specialty were considered as confounding factors.

Age was measured in full years.

Ethnicity referred to self-determined national identity and was classified as Estonian / non-Estonian (mainly Russian).

Place of residence was determined as Tallinn (capital of Estonia), other city, other (not urban) settlement.

Medical specialty was determined based on self-reported specialty and was analysed in three groups: family physician, specialist doctor, dentist.

The study methodology follows The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement guidelines for reporting observational studies.

Data analysis

Data were analysed separately for men and women. Mean age of respondents with standard deviation was calculated. Distribution (%) of respondents by background variables and by agreement with seven statements concerning attitudes towards smoking was calculated. Chi-

squared test was used to find differences in background variables and in attitudes towards smoking between 2002 and 2014. Significance level was set at 0.05. The age-standardized smoking prevalence with corresponding 95% confidence intervals was calculated using European standard population.[17]

Multiple binary logistic regression models were used to analyse association of physicians' attitudes towards smoking with study year and smoking status. The models used dichotomized approvement (agreed *vs* disagreed) as a dependent variable and study year, smoking status, age, ethnicity, place of residence, and medical specialty as explanatory variables. Fully adjusted odds ratios (ORs) with corresponding 95% confidence intervals (CI) were calculated.

Questionnaires with missing smoking status values (n=11) were excluded from the analysis. In total, 4877 questionnaires were included to the descriptive analysis (n=2539 in 2002, n=2338 in 2014). Questionnaires that lacked information concerning background variables and attitudes towards smoking or where in the statements 'cannot say' was answered were excluded from the chi-squared tests and logistic regression models.

Data were analysed using statistical package Stata 11.

RESULTS

Background variables

An overview of physicians' main background variables is provided in table 2. The majority of participants were females (83.6% in 2002 and 82.5% in 2014). Among men 50.8% in 2002 and 38.1% in 2014 were younger than 45 years ($p<0.001$) and among women 45.4% in 2002 and 38.8% in 2014 were younger than 45 years old ($p<0.001$). Mean age of male physicians was 45.2±9.8 in 2002 and 46.9±10.9 in 2014 and of female physicians 46.4±10.2 in 2002 and 46.7±11.2 in 2014, respectively.

Table 2. Distribution (%) of respondents by background variables and corresponding p-values by gender among Estonian physicians in 2002 and 2014

Variable	Men			Women		
	2002 n=417	2014 n=409	p-value[a]	2002 n=2132	2014 n=1930	p-value[a]
Age group			<0.001			<0.001
<45	50.8	38.1		45.4	38.8	
≥45	49.1	61.9		54.6	61.2	
Ethnicity			0.050			0.748
Estonians	79.4	75.1		84.1	83.8	
Non-Estonians	18.7	24.7		15.7	16.1	
Missing answer	1.9	0.2		0.3	0.1	
Place of residence			0.381			0.001
Tallinn	36.5	41.3		32.6	37.0	
Other city	47.0	44.0		46.0	40.6	
Other (rural)	15.8	14.4		20.7	22.1	
Missing answer	0.7	0.2		0.7	0.2	
Medical specialty			0.460			<0.001
Family physician	9.4	9.0		21.0	25.3	
Specialist doctor	77.5	74.6		53.8	48.2	
Dentist	9.6	12.2		23.3	24.7	
Missing answer	3.6	4.2		1.9	1.8	

[a]P-values demonstrate significant differences (p<0.05) between study years.

Smoking status

The age-standardized prevalence of daily and occasional smoking was lower, but age-standardized prevalence of never smoking was higher in 2014 than in 2002 (Table 3). Age-standardized prevalence of past smoking was similar in 2002 and 2014.

Table 3. The age-standardized prevalence of daily, occasional, past and never smoking (n, %, 95% CI) by gender among Estonian physicians in 2002 and 2014

Smoking status	Men		Women	
	2002 n=417	2014 n=409	2002 n=2122	2014 n=1929
Daily	18.4 (14.5–22.3)	11.8 (8.6–15.0)	6.2 (5.1– 7.3)	4.4 (3.5– 5.3)
Occasional	8.4 (5.4–11.3)	3.5 (1.7– 5.3)	4.2 (3.3– 5.2)	1.4 (0.9– 2.0)
Past	29.8 (25.3–34.3)	26.1 (22.1–30.0)	16.1 (14.5–17.8)	16.5 (14.9–18.2)
Never	43.4 (38.4–48.5)	58.6 (54.0–63.3)	73.4 (71.5–75.4)	77.7 (75.9–79.5)

Attitudes towards smoking

Table 4 summarizes physicians' responses regarding attitudes towards smoking in 2002 and 2014. Compared to 2002, in 2014 the attitudes towards smoking were less favourable among both, male and female physicians.

Table 4. Attitudes towards smoking (%) and according p-values by gender among Estonian physicians in 2002 and 2014

Statements	Men			Women		
	2002 n=417	2014 n=409	p-value [a]	2002 n=2132	2014 n=1930	p-value [a]
Smoking is very harmful to the health [b]			<0.001			<0.001
Agree	63.3	79.0		71.5	88.1	
Disagree	35.3	20.3		27.3	11.5	
Missing	1.4	0.7		1.2	0.4	
It is important to reduce smoking among the population			0.001			<0.001
Agree	89.0	96.3		93.3	97.8	
Disagree	7.2	2.2		3.1	1.0	
Cannot say	2.4	0.7		2.3	0.6	
Missing	1.4	0.7		1.4	0.6	
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking			<0.001			<0.001
Agree	23.5	14.2		18.4	13.6	
Disagree	67.1	82.4		68.7	83.0	
Cannot say	7.4	1.2		10.8	2.4	
Missing	1.9	2.2		2.1	1.1	
Smoking does not damage my health as long as I follow a healthy life style in other fields			0.011			<0.001
Agree	10.1	5.6		8.0	4.1	
Disagree	83.4	91.7		84.7	93.8	
Cannot say	4.1	0.5		5.4	1.2	
Missing	2.4	2.2		1.9	0.9	
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare			0.415			<0.001
Agree	17.0	15.9		15.1	11.5	
Disagree	74.3	80.9		75.1	85.3	
Cannot say	6.5	1.0		7.9	2.2	
Missing	2.2	2.2		1.9	1.0	
To smoke or not to smoke, that is my personal choice			0.201			<0.001
Agree	53.5	51.1		47.9	42.6	
Disagree	40.0	46.0		46.6	56.2	
Cannot say	4.6	0.5		4.2	0.4	
Missing	1.9	2.4		1.4	0.8	
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day			0.017			<0.001

Agree	13.2	8.5	7.8	4.4
Disagree	78.7	87.8	83.5	92.8
Cannot say	6.2	1.2	7.0	1.9
Missing	1.9	2.4	1.7	0.9

[a]P-values demonstrate significant differences (p<0.05) between study years.
[b]Option "Cannot say" was not available for this question in the questionnaire.

Association of physicians' attitudes towards smoking with study year and their smoking status

Multiple binary logistic regression demonstrated less approving attitudes towards smoking in 2014 than in 2002 (Table 5). Compared to 2002, in 2014 male and female physicians agreed significantly more with the statements:

- smoking is very harmful;
- it is important to reduce smoking among the population.

Compared to 2002, in 2014 male and female physicians agreed significantly less with the statements:

- to stop smoking is very hard for many people, so it is better for their health to simply continue smoking;
- smoking does not damage my health as long as I follow a healthy life style in other fields.

Compared to 2002, in 2014 only female physicians agreed significantly less with the statements:

- as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare;
- to smoke or not to smoke, that is my personal choice;
- smoking is only dangerous to my health if I smoke more than 10 cigarettes a day.

Agreement with all seven statements was associated with smoking status of male and female physicians.

Table 5. Association of physicians' attitudes towards smoking (agreed *vs* disagreed) with study year and smoking status (OR, 95% CI) by gender among Estonian physicians in 2002 and 2014

Agree	Men	Women
	OR[a] (95% CI)	OR[a] (95% CI)
Smoking is very harmful to the health		
2014 *vs* 2002	2.13 (1.51–3.01)	2.81 (2.35–3.36)
smokers *vs* non-smokers	0.27 (0.19–0.39)	0.22 (0.17–0.27)
It is important to reduce smoking among the population		
2014 *vs* 2002	3.86 (1.69–8.80)	2.96 (1.75–5.03)
smokers *vs* non-smokers	0.41 (0.20–0.84)	0.27 (0.16–0.45)
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking		
2014 *vs* 2002	0.48 (0.32–0.72)	0.62 (0.52–0.74)
smokers *vs* non-smokers	2.54 (1.67–3.86)	3.46 (2.67–4.49)
Smoking does not damage my health as long as I follow a healthy life style in other fields		
2014 *vs* 2002	0.43 (0.23–0.79)	0.48 (0.36–0.65)
smokers *vs* non-smokers	6.86 (3.90–12.06)	4.56 (3.29–6.33)
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare		
2014 *vs* 2002	0.96 (0.63–1.47)	0.72 (0.59–0.87)
smokers *vs* non-smokers	5.88 (3.83–9.02)	3.75 (2.88–4.89)
To smoke or not to smoke, that is my personal choice		
2014 *vs* 2002	1.01 (0.74–1.38)	0.78 (0.68–0.89)
smokers *vs* non-smokers	5.87 (3.70–9.30)	4.59 (3.47–6.08)
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day		
2014 *vs* 2002	0.60 (0.36–1.00)	0.51 (0.39–0.69)
smokers *vs* non-smokers	4.77 (2.90–7.84)	4.32 (3.10–6.04)

[a]Adjusted for study year, smoking status, age, ethnicity, place of residence and medical specialty.

DISCUSSION

The study analysed smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014. Compared to the first study year, smoking prevalence was lower and attitudes towards smoking were less favourable in 2014. However, smoking physicians had more approving attitudes towards smoking than their non-smoking colleagues and this remained the same over the study period.

Smoking status. The age-standardized prevalence of daily smoking decreased 1.6 times among male and 1.4 times among female physicians from 2002 to 2014 (the age-standardized prevalence of occasional smoking 2.3 and 3.0 times, respectively). This result was expected as

smoking among physicians in Estonia has decreased since 1978.[18] Smoking rates in Estonia have come down among general population as well. In 2002, daily smoking prevalence was 49.6% among men and 20.3% among women.[19] In 2014, 31.4% of men and 15.8% of women were daily smokers. Although Estonia is considered to have reached the mature state in terms of smoking epidemic, the prevalence of daily smoking among physicians in 2014 was still comparable to the rates of daily smoking among Finnish doctors in 2002.[12]

Association between attitudes towards smoking and study year. The results of this study showed that attitudes towards smoking were less approving in 2014 compared to 2002.

Agreement with the four statements of seven was associated with study year and smoking among male and female physicians. Agreement with the statements that smoking is very harmful and that it is important to reduce smoking among the population, was more prevalent in 2014 and less prevalent among smoking physicians. This finding is in accordance with previous international studies showing that compared to non-smokers, smoking physicians agree less that smoking is harmful.[4]

Agreement with the statements that to stop smoking is very hard for many people, so it is better for their health to simply continue smoking and that smoking does not damage my health as long as I follow a healthy life style in other fields, was less prevalent in 2014.

Agreement with the three statements of seven was associated with study year among female physicians only. Association was found between study year and agreement with the statements that as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare, that to smoke or not to smoke, that is my personal choice, and that smoking is only dangerous to my health if I smoke more than 10 cigarettes a day' among male physicians. This confirms results from previous studies, according to which smoking behaviour has different patterns among men and women.[20,21] The difference in opinions between genders might be related to the fact that behaviour of men

in general is considered to be more risk-prone. The findings of present study might support the notion that in Estonia, social acceptability of smoking has decreased and attention has turned towards prevention and health promotion.

Overall, Estonian physicians' attitudes towards smoking have improved from 2002 to 2014 and the developments concerning decline of smoking in Estonia have created a supportive environment for that. Estonian Tobacco Act, enforced in 2001, renewed in 2005 and amended since with several legal instruments, sets the requirements for creating a smoke-free environment, availability and pricing of tobacco products. Many of Estonian health care institutions have joined the network for tobacco free health services,[22] and despite the fact that in health care institutions in Estonia, smoking is still allowed in designated smoking areas, many hospitals promote reducing smoking among staff, have prohibited smoking everywhere in the hospital area and have declared the hospital smoke-free.

Association between attitudes towards smoking and smoking status. Agreement with all seven statements described above was associated with smoking status of male and female physicians. Most drastically, compared to non-smokers, men who smoked, had six times higher odds to agree that smoking is not as dangerous as experts declare, and had seven times higher odds to agree that smoking does not damage health if the person leads an otherwise healthy lifestyle. For smokers, the beliefs that smoking is not dangerous to health might be based on the fact that not all persons who smoke will develop adverse effects of smoking like lung cancer or other smoking-related diseases.

The fact that compared to non-smokers, smoking physicians agreed less that it is important to reduce smoking and believe more that to smoke is person's own choice demonstrates that smoking physicians might feel the need for justification for their own behaviour, especially if they have not developed any smoking-related health problems. Opinions on that matter might also indicate that physicians lessen their role in reducing

smoking in the population. According to the worldwide literature, attitudes towards smoking differ by region. In former studies among Italian physicians specializing in public health, 79.6% considered health professionals as behavioural models for patients, and 96.6% affirmed that health professionals have a role in giving advice or information about smoking cessation.[23] In Serbia, 60.7% of physicians agreed that healthcare professionals serve as role models for their patients and public.[24] However, data from a focus group interview carried out among Armenian doctors revealed that the majority of doctors believed they have no role in patients' quitting.[25] Compared to Finnish physicians, Estonian physicians were less conscious of their role as healthy life style exemplars in 2002.[12] Authors then argued that there might be a fear to influence other people's behaviour in Estonia. Results of the present study indicate that the fear still exists.

Although it has been shown before that physicians' beliefs about smoking-related diseases were consistent with medical evidence,[18] the results of present study showed that physicians who smoke, may see smoking more favourably. These opinions can affect smoking cessation activities of the physicians as it has been shown that smokers might not anticipate health problems related to smoking.[26]

Study limitations and strengths. Possible limitations of this study should be addressed. Firstly, as the study relied on self-reported data, the bias of self-representation should be considered. Secondly, the corrected response rates of 67.8% in 2002 and 53.1% in 2014 should be taken into account. The possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates. Also, limitations arise from the cross-sectional nature of the study thus not providing the opportunity to investigate causal relationships. Despite these shortcomings, the survey data provides an excellent opportunity to analyse changes in smoking status and attitudes towards

smoking as both surveys were nationwide, the survey methods and questionnaires were similar, and physicians are considered a very homogenous cohort in terms of their education.

Conclusions

Prevalence of smoking among Estonian physicians was lower in 2014 than in 2002. Although, compared to 2002, attitudes towards smoking were less approving in 2014, it was still apparent that doctors who smoked viewed smoking more favourably and this remained the same over the study period.

Continuing monitoring physicians' smoking and attitudes towards smoking will provide information that is useful in development of teaching of tobacco prevention in medical education programs in Estonia.

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Ethics approval and consent to participate

The surveys in 2002 and 2014 were approved by the Research Ethics Committee of the University of Tartu (decisions no. 87/1 and 235/T-12, respectively). An informed consent form including a description of the study design and how the collected data would be used was sent to the recipients with the questionnaires. The form explained that participation in the study would be considered to constitute consent. Additional written consent was not obtained.

Consent for publication

Not applicable.

Availability of data and material

The datasets of 2002 and 2014 are available on request.

Competing interests

The authors declare that they have no competing interests, or other interests that might be perceived to influence the results and discussion reported in this paper.

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Contributions

MP: performed the statistical analysis, interpretation of the data, drafted the manuscript and has been involved in revising the manuscript critically.

KP: made a substantial contribution to the conception and the design of the study, interpretation of the data and has been involved in revising the manuscript critically.

Authors have read and approved the final manuscript.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract Study design is commonly used term in the title and abstract; Title: *Smoking and attitudes towards smoking among Estonian physicians: results from cross-sectional studies in 2002 and 2014* (page 1) Abstract: *Two self-administered cross-sectional postal surveys were conducted in 2002 and 2014.* (page 2)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found An informative and balanced summary of what was done and what was found was provided in the abstract.(page 2)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported The scientific background and rational for the investigation being reported was explained. (page 4)
Objectives	3	State specific objectives, including any prespecified hypotheses Specific objectives were stated. *The objective of this study was to explore smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014.* (page 4)
Methods		
Study design	4	Present key elements of study design early in the paper Key elements of study design were presented early in the paper. First part in METHODS is Study design.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection The setting, locations, study years, and data collection were described (page 6).
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants The eligibility criteria, and the sources and methods of selection of participants of cross-sectional study were described. (page 6)
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case –
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable All outcomes, exposure, potential confounders were clearly defined (page 6–8).
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there

		is more than one group For each variable of interest sources of data and details of methods of assessment was given. (page 6–8)
Bias	9	Describe any efforts to address potential sources of bias Effort to address potential source of bias was described (page 9).
Study size	10	Explain how the study size was arrived at Explanation how the study size arrived at was included (page 6).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Handling quantitative variables in the analysis was explained. Grouping of variables was described (page 8).
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding All statistical methods, including those used to control for confounding variables were described (page 7–9).
		(*b*) Describe any methods used to examine subgroups and interactions Methods to examine subgroups were described (page 7–9).
		(*c*) Explain how missing data were addressed Addressing missing data was described (page 9).
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy Not applicable
		(*e*) Describe any sensitivity analyses –

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed All numbers of individuals at each stage of study were reported. (page 5–8)
		(b) Give reasons for non-participation at each stage Reason for non-participation was given. (page 5)
		(c) Consider use of a flow diagram –
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Background variables of participants and information on exposure were reported. (page 8–10)
		(b) Indicate number of participants with missing data for each variable of interest Number of participants with missing data for each variable of interest was indicated. (p 8–10)
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount) –
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time –
		Case-control study—Report numbers in each exposure category, or summary measures of exposure –
		Cross-sectional study—Report numbers of outcome events or summary measures Numbers of outcome measures was reported. (page 9–10)
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included Confounder-adjusted estimates with 95% confidence intervals were presented.(lk 12)
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses –
Discussion		
Key results	18	Summarise key results with reference to study objectives Key results with reference to study objectives were summarized. (page 13)
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. Limitations of the study were discussed. (page 16)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. Interpretation was given. (page 13–16)
Generalisability	21	Discuss the generalisability (external validity) of the study results. Generalisability of the study results was discussed. (page 16)
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable,

for the original study on which the present article is based
Sources of funding were given.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Smoking prevalence and attitudes towards smoking among Estonian physicians: results from cross-sectional studies in 2002 and 2014

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Smoking prevalence and attitudes towards smoking among Estonian physicians: results from cross-sectional studies in 2002 and 2014

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Abstract

Objectives: To explore smoking prevalence and attitudes towards smoking among Estonian physicians in 2002 and 2014.

Design: Two self-administered cross-sectional postal surveys were conducted among practicing physicians in Estonia.

Participants: Initial sample consisted of all practicing physicians in Estonia. The corrected response rate was 67.8% in 2002 and 53.1% in 2014. Present study sample was restricted to physicians younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Methods: Age-standardized prevalence of smoking and prevalence of agreement with seven statements concerning attitudes towards smoking was determined. To analyse association of physicians' attitudes towards smoking with study year and smoking status, logistic regression analysis was used. Adjusted odds ratios of agreement with the seven statements were determined. Corresponding 95% confidence intervals were calculated.

Results: The age-standardized prevalence of current smoking among men was 26.8% in 2002 and 15.3% in 2014, among women 10.4% and 5.8%, respectively. Compared to the year 2002, in 2014 prevalence of agreement with statements declaring harmfulness of smoking was higher and prevalence of agreement with statements approving smoking was lower. Adjusted odds ratios showed that compared to 2002, physicians' attitudes towards smoking were less favourable in 2014, and physicians' attitudes towards smoking were associated with their smoking status.

Conclusions: Compared to 2002, the age-standardized smoking prevalence among male and female physicians was lower and attitudes towards smoking were less approving in 2014, the. Smoking physicians had more approving attitudes towards smoking than their non-smoking colleagues.

Strengths and limitations of this study

- The surveys were nationwide, initially involving all practicing physicians in Estonia.
- Changes in smoking prevalence were easily comparable due to similar methods and questionnaires used in 2002 and 2014.
- The surveys relied on self-reported data and therefore the bias of self-representation should be considered.
- In terms of response rates, the possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates.

INTRODUCTION

Smoking is among the leading preventable causes of death and is considered a major public health threat. According to WHO, among adults aged 30 years and over, 12% of all deaths are attributed to tobacco.[1] Reducing smoking will result in fewer deaths and less diseases like lung cancer, heart diseases, stroke, chronic respiratory diseases and other conditions.[2]

Physicians are generally regarded as people from whom smokers would accept advice on smoking cessation.[3] However, physicians' smoking status could affect their attitudes towards smoking and their enthusiasm in addressing patients' smoking.[4, 5]

Smoking behaviour among physicians has been studied for decades. British male doctors smoking cohort study is the most commonly known and began in 1951.[6] In the developed countries (e.g. United States, Australia, Finland, Denmark), smoking among physicians has declined during the last decades,[7–9] being lower than in general population and thus reflecting the maturity of the country's tobacco epidemic. At the same time, in the developing countries (e.g. Mexico, Philippines) smoking prevalence rates among physicians are much higher than in developed countries being in some cases even higher than in general population.[10,11] In Estonia smoking among physicians has declined since 1978.[12–15] Despite being lower than in general population, smoking among doctors in Estonia is still higher than in neighbouring country Finland.[12]

As smoking physicians tend to underestimate smoking as a risk factor, it is important to analyse physicians' smoking and their attitudes towards smoking to involve them in patients' smoking cessation more effectively.

The objective of this study was to explore smoking prevalence and attitudes towards smoking among Estonian physicians in 2002 and 2014.

METHODS

Study design

The present study was based on two cross-sectional self-administered postal smoking surveys among Estonian physicians in 2002 and 2014. Initially, the surveys involved all practicing physicians in Estonia. In 2002, physicians were drawn from the database of Estonian Health Insurance Fund. In 2014, sample was based on the data from the Estonian Health Care Professionals Registry. In 2002, the questionnaires were mailed to the physicians' workplace. Non-respondents received the questionnaire twice. In 2014, the survey materials were mailed to the physicians' home address. To receive home addresses, data from the Estonian Health Care Professionals Registry were linked with the Population Registry in Estonia. Non-respondents received a reminder letter in a month and another envelope containing survey materials in two months.

The questionnaire used in these surveys was originally developed by the WHO and modified according to the Estonian health care system.[16] In 2014, the questions regarding nicotine dependence were added to the questionnaire. Questionnaires concerned individual characteristics, smoking behaviour, attitudes towards and knowledge about tobacco use but also attitudes towards patients' smoking.

The initial survey sample size of all practicing physicians in Estonia was 4140 in 2002 and 5666 in 2014 (Table 1). Number of respondents was 2747 and 2903, respectively. The crude response rate was 66.3% in 2002, and 52.0% in 2014. Corrected response rates (excluding the persons who were unavailable, retired, had wrong address, left Estonia or were dead) were 67.8% and 53.1%, respectively.

The sample for the present study was restricted to physicians who were younger than 65 years (n=2549 in 2002, n=2339 in 2014).

Table 1. Initial sample size, number and percentage of respondents, crude and corrected response rates by gender among Estonian physicians in 2002 and 2014

Study year	Initial sample size (n, %)			Number of respondents (n, %)			Response rate (%)	
	Men	Women	Total	Men	Women	Total	Crude	Corrected
2002	846 (20.4)	3294 (79.6)	4140	471 (17.1)	2276 (82.9)	2747	66.3	67.8
2014	1283 (22.6)	4383 (77.4)	5666	532 (18.3)	2371 (81.7)	2903	51.9	53.1

Study variables

The main outcomes were smoking status and physicians' attitudes towards smoking.

Smoking status was determined by combining answers to several questions concerning smoking and classified as following:

- Daily smokers (those who currently smoke every day);
- Occasional smokers (those who currently smoke but not every day)
- Past smokers (those who have smoked regularly for at least a year but are currently non-smokers);
- Never smokers (those who have smoked irregularly less than a year but are not current smokers or have never smoked at all).

For secondary data analysis smoking status was dichotomized to current smokers (daily and occasional smokers) and non-smokers (past and never smokers). Smoking, in the present study, was defined as smoking cigarettes.

Statements concerning smoking. Attitudes towards smoking were determined with following seven statements:

- Smoking is very harmful to health;
- It is important to reduce smoking among the population;
- To stop smoking is very hard for many people, so it is better for their health to simply continue smoking;
- Smoking does not damage my health as long as I follow a healthy life style in other fields;

- As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare;
- To smoke or not to smoke, that is my personal choice;
- Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day.

In the first statement physicians assessed the harmfulness of smoking using 10-point scale (10 = very harmful). Those who had chosen 8–10, were considered as having agreed that smoking is very harmful to the health. Those who had chosen 1–7, were considered as disagreed. In all other statements, possible answers were completely agree / somewhat agree /rather disagree / completely disagree / cannot say. For secondary analysis answers were dichotomized as agree (completely agree, somewhat agree) and disagree (rather disagree, completely disagree). Background variables age, ethnicity, place of residence and medical specialty were considered as confounding factors.

Age was measured in full years.

Ethnicity referred to self-determined national identity and was classified as Estonian / non-Estonian (mainly Russian).

Place of residence was determined as Tallinn (capital of Estonia), other city, other (not urban) settlement.

Medical specialty was determined based on self-reported specialty and was analysed in three groups: family physician, specialist doctor, dentist.

The study methodology follows The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement guidelines for reporting observational studies.

Data analysis

Data were analysed separately for men and women. Mean age of respondents with standard deviation was calculated. Distribution (%) of respondents by background variables and by agreement with seven statements concerning attitudes towards smoking was calculated. Chi-

squared test was used to find differences in background variables and in attitudes towards smoking between 2002 and 2014. Significance level was set at 0.05. The age-standardized smoking prevalence with corresponding 95% confidence intervals was calculated using European standard population.[17]

Multiple binary logistic regression models were used to analyse association of physicians' attitudes towards smoking with study year and smoking status. The models used dichotomized approvement (agreed *vs* disagreed) as a dependent variable and study year, smoking status, age, ethnicity, place of residence, and medical specialty as explanatory variables. Fully adjusted odds ratios (ORs) with corresponding 95% confidence intervals (CI) were calculated.

Questionnaires with missing smoking status values (n=11) were excluded from the analysis. In total, 4877 questionnaires were included to the descriptive analysis (n=2539 in 2002, n=2338 in 2014). Questionnaires that lacked information concerning background variables and attitudes towards smoking or where in the statements 'cannot say' was answered were excluded from the chi-squared tests and logistic regression models.

Data were analysed using statistical package Stata 11.

RESULTS

Background variables

An overview of physicians' main background variables is provided in table 2. The majority of participants were females (83.6% in 2002 and 82.5% in 2014). Among men 50.8% in 2002 and 38.1% in 2014 were younger than 45 years ($p<0.001$) and among women 45.4% in 2002 and 38.8% in 2014 were younger than 45 years old ($p<0.001$). Mean age of male physicians was 45.2±9.8 in 2002 and 46.9±10.9 in 2014 and of female physicians 46.4±10.2 in 2002 and 46.7±11.2 in 2014, respectively.

Table 2. Distribution (%) of respondents by background variables and corresponding p-values by gender among Estonian physicians in 2002 and 2014

Variable	Men			Women		
	2002 n=417	2014 n=409	p-value[a]	2002 n=2132	2014 n=1930	p-value[a]
Age group			<0.001			<0.001
<45	50.8	38.1		45.4	38.8	
≥45	49.1	61.9		54.6	61.2	
Ethnicity			0.050			0.748
Estonians	79.4	75.1		84.1	83.8	
Non-Estonians	18.7	24.7		15.7	16.1	
Missing answer	1.9	0.2		0.3	0.1	
Place of residence			0.381			0.001
Tallinn	36.5	41.3		32.6	37.0	
Other city	47.0	44.0		46.0	40.6	
Other (rural)	15.8	14.4		20.7	22.1	
Missing answer	0.7	0.2		0.7	0.2	
Medical specialty			0.460			<0.001
Family physician	9.4	9.0		21.0	25.3	
Specialist doctor	77.5	74.6		53.8	48.2	
Dentist	9.6	12.2		23.3	24.7	
Missing answer	3.6	4.2		1.9	1.8	

[a]P-values demonstrate significant differences (p<0.05) between study years.

Smoking status

The age-standardized prevalence of daily and occasional smoking was lower, but age-standardized prevalence of never smoking was higher in 2014 than in 2002 (Table 3). Age-standardized prevalence of past smoking was similar in 2002 and 2014.

Table 3. The age-standardized prevalence of daily, occasional, past and never smoking (n, %, 95% CI) by gender among Estonian physicians in 2002 and 2014

Smoking status	Men		Women	
	2002 n=417	2014 n=409	2002 n=2122	2014 n=1929
Daily	18.4 (14.5–22.3)	11.8 (8.6–15.0)	6.2 (5.1– 7.3)	4.4 (3.5– 5.3)
Occasional	8.4 (5.4–11.3)	3.5 (1.7– 5.3)	4.2 (3.3– 5.2)	1.4 (0.9– 2.0)
Past	29.8 (25.3–34.3)	26.1 (22.1–30.0)	16.1 (14.5–17.8)	16.5 (14.9–18.2)
Never	43.4 (38.4–48.5)	58.6 (54.0–63.3)	73.4 (71.5–75.4)	77.7 (75.9–79.5)

Attitudes towards smoking

Table 4 summarizes physicians' responses regarding attitudes towards smoking in 2002 and 2014. Compared to 2002, in 2014 the attitudes towards smoking were less favourable among both, male and female physicians.

Table 4. Attitudes towards smoking (%) and according p-values by gender among Estonian physicians in 2002 and 2014

Statements	Men			Women		
	2002 n=417	2014 n=409	p-value [a]	2002 n=2132	2014 n=1930	p-value [a]
Smoking is very harmful to the health [b]			<0.001			<0.001
Agree	63.3	79.0		71.5	88.1	
Disagree	35.3	20.3		27.3	11.5	
Missing	1.4	0.7		1.2	0.4	
It is important to reduce smoking among the population			0.001			<0.001
Agree	89.0	96.3		93.3	97.8	
Disagree	7.2	2.2		3.1	1.0	
Cannot say	2.4	0.7		2.3	0.6	
Missing	1.4	0.7		1.4	0.6	
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking			<0.001			<0.001
Agree	23.5	14.2		18.4	13.6	
Disagree	67.1	82.4		68.7	83.0	
Cannot say	7.4	1.2		10.8	2.4	
Missing	1.9	2.2		2.1	1.1	
Smoking does not damage my health as long as I follow a healthy life style in other fields			0.011			<0.001
Agree	10.1	5.6		8.0	4.1	
Disagree	83.4	91.7		84.7	93.8	
Cannot say	4.1	0.5		5.4	1.2	
Missing	2.4	2.2		1.9	0.9	
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare			0.415			<0.001
Agree	17.0	15.9		15.1	11.5	
Disagree	74.3	80.9		75.1	85.3	
Cannot say	6.5	1.0		7.9	2.2	
Missing	2.2	2.2		1.9	1.0	
To smoke or not to smoke, that is my personal choice			0.201			<0.001
Agree	53.5	51.1		47.9	42.6	
Disagree	40.0	46.0		46.6	56.2	
Cannot say	4.6	0.5		4.2	0.4	
Missing	1.9	2.4		1.4	0.8	
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day			0.017			<0.001

Agree	13.2	8.5	7.8	4.4
Disagree	78.7	87.8	83.5	92.8
Cannot say	6.2	1.2	7.0	1.9
Missing	1.9	2.4	1.7	0.9

[a]P-values demonstrate significant differences ($p<0.05$) between study years.
[b]Option "Cannot say" was not available for this question in the questionnaire.

Association of physicians' attitudes towards smoking with study year and their smoking status

Multiple binary logistic regression demonstrated less approving attitudes towards smoking in 2014 than in 2002 (Table 5). Compared to 2002, in 2014 male and female physicians agreed significantly more with the statements:

- smoking is very harmful;
- it is important to reduce smoking among the population.

Compared to 2002, in 2014 male and female physicians agreed significantly less with the statements:

- to stop smoking is very hard for many people, so it is better for their health to simply continue smoking;
- smoking does not damage my health as long as I follow a healthy life style in other fields.

Compared to 2002, in 2014 only female physicians agreed significantly less with the statements:

- as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare;
- to smoke or not to smoke, that is my personal choice;
- smoking is only dangerous to my health if I smoke more than 10 cigarettes a day.

Agreement with all seven statements was associated with smoking status of male and female physicians.

Table 5. Association of physicians' attitudes towards smoking (agreed *vs* disagreed) with study year and smoking status (OR, 95% CI) by gender among Estonian physicians in 2002 and 2014

Agree	Men	Women
	OR[a] (95% CI)	OR[a] (95% CI)
Smoking is very harmful to the health		
2014 *vs* 2002	2.13 (1.51–3.01)	2.81 (2.35–3.36)
smokers *vs* non-smokers	0.27 (0.19–0.39)	0.22 (0.17–0.27)
It is important to reduce smoking among the population		
2014 *vs* 2002	3.86 (1.69–8.80)	2.96 (1.75–5.03)
smokers *vs* non-smokers	0.41 (0.20–0.84)	0.27 (0.16–0.45)
To stop smoking is very hard for many people, so it is better for their health to simply continue smoking		
2014 *vs* 2002	0.48 (0.32–0.72)	0.62 (0.52–0.74)
smokers *vs* non-smokers	2.54 (1.67–3.86)	3.46 (2.67–4.49)
Smoking does not damage my health as long as I follow a healthy life style in other fields		
2014 *vs* 2002	0.43 (0.23–0.79)	0.48 (0.36–0.65)
smokers *vs* non-smokers	6.86 (3.90–12.06)	4.56 (3.29–6.33)
As many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare		
2014 *vs* 2002	0.96 (0.63–1.47)	0.72 (0.59–0.87)
smokers *vs* non-smokers	5.88 (3.83–9.02)	3.75 (2.88–4.89)
To smoke or not to smoke, that is my personal choice		
2014 *vs* 2002	1.01 (0.74–1.38)	0.78 (0.68–0.89)
smokers *vs* non-smokers	5.87 (3.70–9.30)	4.59 (3.47–6.08)
Smoking is only dangerous to my health if I smoke more than 10 cigarettes a day		
2014 *vs* 2002	0.60 (0.36–1.00)	0.51 (0.39–0.69)
smokers *vs* non-smokers	4.77 (2.90–7.84)	4.32 (3.10–6.04)

[a]Adjusted for study year, smoking status, age, ethnicity, place of residence and medical specialty.

DISCUSSION

The study analysed smoking and attitudes towards smoking among Estonian physicians in 2002 and 2014. Compared to the first study year, smoking prevalence was lower and attitudes towards smoking were less favourable in 2014. However, smoking physicians had more approving attitudes towards smoking than their non-smoking colleagues.

Smoking status. The age-standardized prevalence of daily smoking decreased 1.6 times among male and 1.4 times among female physicians from 2002 to 2014 (the age-standardized prevalence of occasional smoking 2.3 and 3.0 times, respectively). This result was expected as smoking among physicians in Estonia has decreased since 1978.[18] Smoking rates in Estonia

have come down among general population as well. In 2002, daily smoking prevalence was 49.6% among men and 20.3% among women.[19] In 2014, 31.4% of men and 15.8% of women were daily smokers. Although Estonia is considered to have reached the mature state in terms of smoking epidemic, the prevalence of daily smoking among physicians in 2014 was still comparable to the rates of daily smoking among Finnish doctors in 2002.[12]

Association between attitudes towards smoking and study year. The results of this study showed that attitudes towards smoking were less approving in 2014 compared to 2002.

Agreement with the four statements of seven was associated with study year and smoking among male and female physicians. Agreement with the statements that smoking is very harmful and that it is important to reduce smoking among the population, was more prevalent in 2014 and less prevalent among smoking physicians. This finding is in accordance with previous international studies showing that compared to non-smokers, smoking physicians agree less that smoking is harmful.[4]

Agreement with the statements that to stop smoking is very hard for many people, so it is better for their health to simply continue smoking and that smoking does not damage my health as long as I follow a healthy life style in other fields, was less prevalent in 2014.

Agreement with the three statements of seven was associated with study year among female physicians only. Association was found between study year and agreement with the statements that as many people have smoked for their whole lives until old age and not become ill, smoking is not as dangerous as experts declare, that to smoke or not to smoke, that is my personal choice, and that smoking is only dangerous to my health if I smoke more than 10 cigarettes a day' among male physicians. This confirms results from previous studies, according to which smoking behaviour has different patterns among men and women.[20,21] The difference in opinions between genders might be related to the fact that behaviour of men in general is considered to be more risk-prone.[22] The findings of present study might

support the notion that in Estonia, social acceptability of smoking has decreased and attention has turned towards prevention and health promotion.

Overall, Estonian physicians' attitudes towards smoking have improved from 2002 to 2014 and the developments concerning decline of smoking in Estonia have created a supportive environment for that. Estonian Tobacco Act, enforced in 2001, renewed in 2005 and amended since with several legal instruments, sets the requirements for creating a smoke-free environment, availability and pricing of tobacco products. Many of Estonian health care institutions have joined the network for tobacco free health services,[23] and despite the fact that in health care institutions in Estonia, smoking is still allowed in designated smoking areas, many hospitals promote reducing smoking among staff, have prohibited smoking everywhere in the hospital area and have declared the hospital smoke-free.

Association between attitudes towards smoking and smoking status. Agreement with all seven statements described above was associated with smoking status of male and female physicians. Most drastically, compared to non-smokers, men who smoked, had six times higher odds to agree that smoking is not as dangerous as experts declare, and had seven times higher odds to agree that smoking does not damage health if the person leads an otherwise healthy lifestyle. For smokers, the beliefs that smoking is not dangerous to health might be based on the fact that not all persons who smoke will develop adverse effects of smoking like lung cancer or other smoking-related diseases.

The fact that compared to non-smokers, smoking physicians agreed less that it is important to reduce smoking and believe more that to smoke is person's own choice demonstrates that smoking physicians might feel the need for justification for their own behaviour, especially if they have not developed any smoking-related health problems. Opinions on that matter might also indicate that physicians lessen their role in reducing smoking in the population. According to the worldwide literature, attitudes towards smoking

differ by region. In former studies among Italian physicians specializing in public health, 79.6% considered health professionals as behavioural models for patients, and 96.6% affirmed that health professionals have a role in giving advice or information about smoking cessation.[24] In Serbia, 60.7% of physicians agreed that healthcare professionals serve as role models for their patients and public.[25] However, data from a focus group interview carried out among Armenian doctors revealed that the majority of doctors believed they have no role in patients' quitting.[26] Compared to Finnish physicians, Estonian physicians were less conscious of their role as healthy life style exemplars in 2002.[12] Authors then argued that there might be a fear to influence other people's behaviour in Estonia. Results of the present study indicate that the fear still exists.

Although it has been shown before that physicians' beliefs about smoking-related diseases were consistent with medical evidence,[18] the results of present study showed that physicians who smoke, may see smoking more favourably. These opinions can affect smoking cessation activities of the physicians as it has been shown that smokers might not anticipate health problems related to smoking.[27]

Study limitations and strengths. Possible limitations of this study should be addressed. Firstly, as the study relied on self-reported data, the bias of self-representation should be considered. Secondly, the corrected response rates of 67.8% in 2002 and 53.1% in 2014 should be taken into account. The possibility that smokers prevail among persistent non-respondents may have led to the underestimation of smoking prevalence rates. Third, limitations could be related to the cross-sectional nature of the study thus not providing the opportunity to investigate causal relationships. Also, as only two time points were used, merely a general tendency of smoking prevalence and attitudes towards smoking can be observed. Despite these shortcomings, the survey data provides an excellent opportunity to analyse changes in smoking status and attitudes towards smoking as both surveys were

nationwide, the survey methods and questionnaires were similar, and physicians are considered a very homogenous cohort in terms of their education.

Conclusions

Prevalence of smoking among Estonian physicians was lower in 2014 than in 2002. Although, compared to 2002, attitudes towards smoking were less approving in 2014, it was still apparent that doctors who smoked viewed smoking more favourably.

Continuing monitoring physicians' smoking and attitudes towards smoking will provide information that is useful in development of teaching of tobacco prevention in medical education programs in Estonia.

Acknowledgments

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Ethics approval and consent to participate

The surveys in 2002 and 2014 were approved by the Research Ethics Committee of the University of Tartu (decisions no. 87/1 and 235/T-12, respectively). An informed consent form including a description of the study design and how the collected data would be used was sent to the recipients with the questionnaires. The form explained that participation in the study would be considered to constitute consent. Additional written consent was not obtained.

Consent for publication

Not applicable.

Availability of data and material

The datasets of 2002 and 2014 are available on request.

Competing interests

The authors declare that they have no competing interests, or other interests that might be perceived to influence the results and discussion reported in this paper.

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Contributions

MP: performed the statistical analysis, interpretation of the data, drafted the manuscript and has been involved in revising the manuscript critically.

KP: made a substantial contribution to the conception and the design of the study, interpretation of the data and has been involved in revising the manuscript critically.

Authors have read and approved the final manuscript.

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STROBE Statement—checklist of items that should be included in reports of observational studies

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract Study design is commonly used term in the title and abstract; Title: *Smoking prevalence and attitudes towards smoking among Estonian physicians: results from cross-sectional studies in 2002 and 2014* (page 1) Abstract: *Two self-administered cross-sectional postal surveys were conducted in 2002 and 2014.* (page 2)
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found An informative and balanced summary of what was done and what was found was provided in the abstract.(page 2)
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported The scientific background and rational for the investigation being reported was explained. (page 4)
Objectives	3	State specific objectives, including any prespecified hypotheses Specific objectives were stated. *The objective of this study was to explore smoking prevalence and attitudes towards smoking among Estonian physicians in 2002 and 2014.* (page 4)
Methods		
Study design	4	Present key elements of study design early in the paper Key elements of study design were presented early in the paper. First part in METHODS is Study design.
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection The setting, locations, study years, and data collection were described (page 6).
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants The eligibility criteria, and the sources and methods of selection of participants of cross-sectional study were described. (page 6)
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case –
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable All outcomes, exposure, potential confounders were clearly defined (page 6–8).
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there

		is more than one group For each variable of interest sources of data and details of methods of assessment was given. (page 6–8)
Bias	9	Describe any efforts to address potential sources of bias Effort to address potential source of bias was described (page 9).
Study size	10	Explain how the study size was arrived at Explanation how the study size arrived at was included (page 6).
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why Handling quantitative variables in the analysis was explained. Grouping of variables was described (page 8).
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding All statistical methods, including those used to control for confounding variables were described (page 7–9).
		(*b*) Describe any methods used to examine subgroups and interactions Methods to examine subgroups were described (page 7–9).
		(*c*) Explain how missing data were addressed Addressing missing data was described (page 9).
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy Not applicable
		(*e*) Describe any sensitivity analyses –

Continued on next page

Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed All numbers of individuals at each stage of study were reported. (page 5–8)
		(b) Give reasons for non-participation at each stage Reason for non-participation was given. (page 5)
		(c) Consider use of a flow diagram –
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders Background variables of participants and information on exposure were reported. (page 8–10)
		(b) Indicate number of participants with missing data for each variable of interest Number of participants with missing data for each variable of interest was indicated. (p 8–10)
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount) –
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time –
		Case-control study—Report numbers in each exposure category, or summary measures of exposure –
		Cross-sectional study—Report numbers of outcome events or summary measures Numbers of outcome measures was reported. (page 9–10)
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included Confounder-adjusted estimates with 95% confidence intervals were presented.(page 12)
		(*b*) Report category boundaries when continuous variables were categorized
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses –
Discussion		
Key results	18	Summarise key results with reference to study objectives Key results with reference to study objectives were summarized. (page 13)
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias. Limitations of the study were discussed. (page 16)
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence. Interpretation was given. (page 13–16)
Generalisability	21	Discuss the generalisability (external validity) of the study results. Generalisability of the study results was discussed. (page 16)
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable,

for the original study on which the present article is based
Sources of funding were given.

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.